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ABSTRACT

Presented is a brief review of major writings on cognition in the field of deaf education, in which the main cognitive-developmental theories are identifed. Within this framework is discussed deaf children's mental development in terms of apparent characteristics and empirical evidences of cognitive behaviors compared with those of children with normal hearing. Implications for teachers of the deaf are also discussed. Surveyed are imagery and memory studies and research on cognition in deaf learners pertaining to Piagetian stages, on categorization and verbalization, on written language, and on concept formation. Favored by the author is the cultural training position, which holds that any intellectual content can be taught early if adapted to the child's cognitive level. (DLS)

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Developments in Cognitive Theory Research with the Deaf and Implications for Teachers

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Running Head: Cognitive Development

Three major cognitive developmental theories are discussed in terms of cognition in deaf children. Cognitive evaluation of the deaf has evolved from an early quantitative focus to a more qualitative one concerned with processes. Substantial research on cognition in deaf learners pertains to Piagetian stages. Furth (1966), Youniss (1970), Tomlinson-Keasey and Kelly cite Piaget in their affirmation that thought, not language, appears first in development. Other researchers investigating cognitive functions of the deaf in a Piagetian framework include Best and Roberts (1976), Ross and Hoemann (1975), Darbyshire (1969), Templin (1966), and Youniss and Robertson (1969, 1970). Imagery and memory studies, categorization and verbalization, written language and concept formation research with deaf children are surveyed. In considering cognitive theories, this writer favors the cultural training position, in which it is held that any intellectual content can be taught early if adapted to the child's cognitive level.

Cognitive Development of the Deaf

Recent court decisions plus extensive national and state legislation requiring free appropriate education for the handicapped have made it incumbent upon educators to review critically programs in special education. Measured or predicted inferior cognitive ability is no longer serving as a rationale for the exclusion of individuals from free public education. In formulating individual behavioral objectives, program writers have a far greater need than ever before to focus on the cognitive processes of individual learners.

Along with the national commitment to provide appropriate education for children comes the emergence of mainstreaming. This movement requires involvement of educators not previously concerned with the discrete thinking abilities of developmentally deviant pupils. It seems imperative that there be increased attention paid to the various components of cognition, and to their maximum development.

There is extensive literature on the cognitive development of handicapped children in general. The area of mental retardation yields the greatest volume of writings, whereas educators of the blind have produced the smallest amount of literature on cognitive development. One issue frequently appearing in discussions of cognition is that of the relationship between mental development and language. Most tests of cognitive ability have a considerable language content, and verbal ability

is cited as the best single predictor of cognitive ability (Kearney, 1969). However, as Wolff (1975) points out, learning and evaluation in schools is based on language competence as necessary for mental development. Such a premise invites failure, frustration, and classification as learning disabled for large numbers of students.

The field of deaf education has produced a substantial body of literature on cognition. Many of these writers have addressed themselves to the language and thought issue; others have explored one specific facet of cognitive development, such as memory or categorization. A number of professionals deal with Piagetian activities or tasks, and Piagetian based curriculum. In addition there is a considerable amount of attention to kinds of tests that measure intelligence and/or cognition in the deaf.

One purpose of this paper is to present a brief review of major writings on cognition in the field of deaf education and to identify the main cognitive-developmental theories and measurement instruments. Within this framework deaf children's mental development will be discussed, in terms of apparent characteristics and empirical evidences of cognitive behaviors similar and/or different from those of children with normal hearing.

Measurement: The Language and Thought Issue

In first reviewing literature on thinking abilities of the

deaf one finds that much of the investigation concerns measurement. It is difficult to consider the topic of individual tests for assessment of intelligence or cognition separately from the issue of the relationship between language and mental development.

One view on this subject includes Piaget's beliefs that actions, not language, provide the basis for logical thought (Piaget, 1963). In line with this is the position of Furth (1966) that intellectual and personality development are not dependent on linguistic competence but on exposure to real life situations. He goes on to explain that language provides intellectual benefit during early development only if it is the means of intellectual stimulation. Vernon (1973) supports this position, stating that cognitive ability is not basically dependent upon language. Lenneberg (1969) holds that language is neither the cause of cognition nor a static product of the mind. Rather, it is a profoundly integrated activity which will give us clues to the operating principles of the brain (p. 640).

The opposite opinion is presented by the following comment

(Myklebust, 1960):

> A philosophical position commonly held is that without language there is no thought and inferentially there is no intelligence of the type associated with the human being. This implies that if language development is precluded, mental development will be affected. If normal language development is necessary for normal development of psychological processes and learning, then the mental growth and intellectual functioning of the deaf child will not parallel that of the hearing child (p. 60).

Early Studies on Mental Development

The earliest tests of intelligence of the deaf began with the work of Pinter, referred to as the "father of the psychology of deafness", and Patterson (Myklebust, 1960). It was concluded from their test results that the general intellectual level of deaf children was below that of normal children (Myklebust, 1960; Vernon, 1968). The realization that what was being measured was not solely intelligence, but was language deprivation, led to the development of the Pinter Non-language Test. Although results on this test showed deaf subjects scoring higher, the mean scores were still significantly below those of hearing peers (Vernon, 1968).

Other pre-1930 studies include tests by Reamer, who tested 2,500 pupils, and Day, Fusfeld, and Pinter, who tested 4,432 pupils. Their

findings supported the previous conclusions that deaf children's intelligence is lower than that of hearing children. Contradictory conclusions came from the test results compiled by Drever and Collins who compared 200 deaf children with 200 hearing children. They found the populations nearly equal in intelligence, if language was not a factor (Vernon, 1968, p. 2).

Later Studies on Mental Development

Significant reviews have been offered by Myklebust (1960) and Vernon (1968) on later studies. These later works were primarily concerned with individual performance type tests (Myklebust, 1960). In Vernon's thorough review of 37 post 1930 studies which involve a wide range of test instruments, the conclusion is drawn that IQs of deaf children are comparable to those of normal children.

Vernon and others (Levine, 1971; Myklebust, 1960) also raise questions about testing techniques used which cast doubt on the validity of results obtained from a number of the tests. Areas of concern include test administration difficulties, the use of group testing techniques, sampling practices, and the use with the deaf of tests which were standardized only on the hearing. Levine (1971) in a comprehensive article on mental assessment of the deaf child lists tests most generally used at present with the deaf, along with several of promise. Guides or criteria for judging test effectiveness are also offered by her.

Recent Trends in Studies on Mental Development

Some recent works on intelligence have distinctive features. An

intelligence test especially useful for deaf children aged two to four years has been scheduled by Western Psychological Services (Note 1; Note 2) for publication in the Spring of 1977. This scale, the Smith-Johnson Nonverbal Performance Scale, is described by Smith (1961; Note 2) as follows:

> The Non-Verbal Performance Scale...is the result of 25 years of selection and elimination of test items with regard to their attractiveness, usefulness, and adaptability to pre-school children, especially hypacousic and other language handicapped children. The scale is independent of verbal instructions and is administered through the medium of demonstration and pantomime.

She goes on to describe this 47 item instrument as follows:

> It consists of a series of age-graded performance tasks adapted from well-known psychological scales, tests, schedules, and inventories. Items were selected with regard to their adaptability for testing language handicapped children and also for their diagnostic potential in the evaluation of clinical manifestations of perceptual difficulty and neurological disturbance (Note 2).

Smith standardized her instrument first on 560 hearing children between ages of twenty-four and forty-eight months who were tested within seven days, plus or minus, of their third month anniversary date (Smith, 1961).

The scale was then restandardized on those with hearing difficulties, between the ages of eighteen months to six years of age, totaling over 350 children (Smith, Note 2).

Taking a qualitative look at deaf children's abilities, Vonderharr & Chambers (1975) examined Wechsler Performance Subtest Scores of 55 deaf adolescents. They found that deaf students as a group do exhibit certain strengths and weaknesses. Significant differences (at the .01 level) were found on the Object Assembly Test, with deaf subjects indicating strengths in this area, and on the Picture Completion Test, with deaf students showing weaknesses on this. De Marco (1969) also looked at Wechsler scores of hearing impaired youths, limiting his study to the hard-of-hearing. He examined Performance and Verbal IQs, focusing major attention on a discussion of the verbal test results. He reported, concerning Performance test results, that the hard-of-hearing do not differ from the norms, in Performance IQ scores.

Mental Structure and Cognitive Processes

Measurement of planning ability, impulse control, conceptual maturity, and perceptual ability to articulate experiences of the world and the self were studied by Best (1974). Using a group of 38 deaf children with a control group of ten hearing children, Best found deaf subjects to be significantly below hearing in degree of structured controls and defenses, and in intellectual performance ability to articulate experience. He defined cognitive ability as "perceptual and general intellectual ability to articulate experience." Using the Portable Rod and Frame test, Best

did not find deaf children to be significantly different in cognitive ability, however, they were below average in planning and in degree of structured controls measured by the Porteus Maze Test. In Vernon's review (1968) there is only one study cited which used the Porteous Maze Test. The investigators were Zeckel and Kalb, who sampled 100 deaf children. Their finding, as cited by Vernon, was "Backward" IQ. In Myklebust's review (1960), reference is made to the Zeckel and Van der Kolk study, which concluded that deaf children were mentally retarded. In light of Vernon's well known work (1968) and conclusions about the IQ of deaf being comparable to that of normal children, this writer questions the appropriateness of continued use of the Porteous Maze Test.

Intellectual, cognitive, perceptual and social development were considered by Koh (1972) who looked at 17 post-rubella deaf children. In a three year follow up evaluation, the children's development was determined to be comparable to or excelling the normative development of normal hearing children during the preschool years. A possible difficulty in higher order conceptual or representational mediation was suggested by the data to arise around the age of five years.

Among those whose concern is the measurement of thinking abilities, it is not uniformly agreed which aspects of mental development should be labeled "intelligence" and which should be designated by the term "cognition". Myklebust cites the factor theory as being used to "clarify the impositions and implications of deafness in relation to intelligence (Myklebust, 1960). Farrant (1964) has contributed much in this area of

factor analysis of intellective abilities in the deaf. Attention is drawn to Guilford's classification of factors on intelligence into five types of mental operations: cognition, memory, convergent thinking, divergent thinking, and evaluation. Among these, cognition is defined as the "ability to recognize and to see relationships" (Myklebust, 1960).

Cognitive Theories

A concept widely articulated by Piaget holds that intelligence has three components: content, function, and structure. These are defined as follows (Wadsworth, 1971, p.21):

> Content refers to observable behaviors. Function refers to those characteristics of intellectual activity, assimilation and accomodation, that are stable and continual throughout cognitive development. Structure refers to the inferred organizational property (schemata) that explain the occurrence of particular behaviors.

Kohlberg (1968) offers several definitions as part of a lengthy discussion on cognitive theories. He has taken a plethora of viewpoints and narrowed them down to what he labels "three broad streams of educational thought." The first is clarified in the following exerpt (Kohlberg, 1968):

> The first stream of thought commences with Rousseau...and is contemporarily represented in the ideas of followers of Freud and Gesell. This maturationist stream of thought holds that what is most important in the development of the child is

> that which comes from within him and that the pedagogical environment should be one which creates a climate to allow inner "goods" (abilities and social virtues) to unfold and the inner "bad" to come under the control of the inner good, rather than to be fixated by adult cultural pressures. (p. 1014)

The extreme of this view is presented by Neill. The second stream of educational thought is identified by Kohlberg as a "cultural training" view:

> ...what is important in the development of the child is his learning of the cognitive and moral knowledge and rules of the culture...education's business is the teaching of such information and rules to the child through direct instruction (p. 1015).

Proponents of this philosophy of cultural training, or as it is otherwise termed, "environmentalism," include John Locke, Thorndike, Skinner, and Bereiter & Engelmann.

Several definitions, which are distinct from those of the other two philosophical camps, come from the cultural trainer/environmentalist position. Cognition is seen as a matter of discrimination and generalization learning. Cognitive development is said to be the result of guided learning of associations between specific discriminative stimuli that are environmental, with specific reinforcements after the responses. Those who adhere to these ideas believe it is possible to teach a child almost any behavior pattern, as long as it is taught within the precepts

of association learning, and started early enough to avoid learning competing response patterns.

The third stream of thought is termed "cognitive-developmental" and is the one which Kohlberg cultivates. Terms are dealt with much more precisely in this orientation:

> The terms "cognition," "thought," or "intelligence" basically refer to adaptive actions upon objects or internalizations of such actions. Mature or adequate cognition is defined by an equilibrium or reciprocity between action and object. Cognition is defined as function (as modes of action) rather than as content (as sets of words, "verbal responses," associations, memories, etc.) (p. 1015).

This approach is based on the view that cognitive and affective structures result from the interaction between the child and the environment, thereby, as Kohlberg interprets, resolving the dichotomy beteen the other two philosophies of maturation and cultural training (Kohlberg, 1968).

Piaget's theories have become quite widespread. When discussing cognitive ideas, activities, and research, professionals rarely omit at least some reference to this theorist. Historically, Piaget is said to have transformed the study of cognitive development by advancing beyond an analysis of intellectual development. Rather than looking at numbers of right answers, he has lead a movement to look at differences in structure (Kohlberg, 1968).

Kohlberg (1968) points out evidences of considerable confusion and/or

misinterpretation of Piaget's stages. There are those who interpret the stages as maturational, thinking Piaget is saying intelligence is unaffected by environment. Others while understanding the organism-environment interaction base of the stages decided that Piaget is saying individual differences in intellectual performance are less hereditary than previously believed.

Stages of Cognitive Development

A substantial amount of literature on cognition in deaf children pertains to Piagetian tasks, activities, research, or theory. To acquire a perspective or frame of reference for examining these and other writings, one can view them in terms of the stages Piaget outlines.

Piaget distinguishes three stages or periods (Beard, 1969) in which he contends that cognitive development is qualitatively different. First is the sensori-motor period, which is from birth until approximately eighteen months of life. Second is the period of concrete operations, subdivided into the preconceptual stage and the intuitive stage. And third, is a period for formal operations, in adolescence. Each of these stages builds on the attainments of the previous one(s).

Considering the possible affect that hearing impairment could have on the development of cognitive structures, Tomlinson-Keasey & Kelly (1974) attempted to analyze deaf children's thought processes in regard to Piaget's theory of cognitive development. Citing Piaget, Furth, and Youniss, Tomlinson-Keasey & Kelly affirm that thought, not language, appears first in development. Language is defined by them as a symbol

system separate from the physical apparatus involved with speech. Recalling that it is during the preoperational period that the child acquires a symbol system, Tomlinson-Keasey & Kelly point out the differences of this period, and its probable frustrations for deaf children. The emergence of symbols at approximately eighteen months begins with the use of images. A child forms a mental image of an object and recalls the image of that object at will. Hearing children, Tomlinson-Keasey & Kelly remid their readers, then attach a spoken symbol to the image and that leads to spoken language.

Regarding the concrete operations stage, Tomlinson-Keasey & Kelly venture that the significance of this stage for the deaf needs to be explored. A preliminary manipulation of symbols not tied to concrete objects is required, they maintain. This notion is supported in part by Darbyshire's study (Darbyshire, 1969) on hearing and deaf children in Piaget type tests modified to eliminate verbal communication. Results showed deaf were not significantly inferior to normal.

Formal operations also are discussed by Tomlinson-Keasey & Kelly. Abstraction and the ability to consider all of the posibilities that exist can be difficult for deaf children. They advise that perhaps the loss of the auditory mode removes one easy way for the child to practice abstraction. They go on to suggest constructing curriculum to provide experience with abstractions thus facilitating a move from the concrete to formal operations.

Piaget's sensori motor stage was the object of a study by Best and Roberts (1976). Using the Infant Psychological Development Scale on

16 deaf children between the ages of 23 and 38 months, and matched hearing subjects as a control group, they determined that deaf children progress normally through the sensori-motor stage except in the vocal imitation area. This area was significantly lower for deaf children.

Higher cognitive function at the formal operations stage is explored by Ross and Hoemann (1975). Using 180 deaf and 286 hearing adolescents, they conducted six experiments to compare the attainment of formal operations as demonstrated on tasks involving probability. The problems presented did not require verbalization. Most of the hearing and many of the deaf subjects reached the formal operations level according to criteria established by Piaget.

Longitudinal Studies

Caouette (1973) undertook a longitudinal study of the mental development of deaf children. Thirty deaf and thirty hearing eight-year-olds were tested on concrete logical behavior. They were retested when they were 15 - 16 on formal logical thinking, concrete logic, and other tasks. One conclusion was that logical thought cannot be reached even at the concrete level without language. Deaf subjects were also found to be six years behind hearing peers in conservation development. It was concluded also that concrete operational structures among deaf subjects are more rigid than among the hearing.

Another researcher using the longitudinal study method was Templin (1966). She tested 60 deaf and 72 normal children on selected cognitive tasks. Conservation tasks were administered, as were several vocabulary measures for assessing common word usage and understanding. Subjects were

retested again after two years. Major findings included: (a) with a few exceptions, scores of deaf subjects were inferior to those of hearing at the same age; (b) performance on Conservation of Number tasks increased and did not differ significantly from that of the hearing by CA 11; (c) on the Conservation of Substance task the performance of deaf subjects at each age tested was significantly lower than that of hearing counterparts, and at all ages was below the CA 6 level of the hearing; (d) the Conservation of Volume tasks were too difficult for all deaf subjects and for CA 6 hearing subjects; (e) deaf subjects seem to vary more than normal do in performance level among different tests; (f) deaf subjects tend to perseverate in their responses on a number of tests; (g) deaf subjects tend to show less incremental learning than normal subjects; (h) the performances of deaf subjects tend to match and occasionally surpass that of normal subjects as the deaf get older.

Imagery and Memory Studies

The period of concrete operations has been reached, as outlined in Piaget's theory (Beard, 1969, p.12), when:

> ...as a result of their actions children internalize ideas of classes and series...Piaget considers that the action in reality is replaced by an action in imagination, called an operation, which may depend on imagery...

Imagery is defined (Beard, 1969, p.x) as "revived sense of experiences without sensory stimulation." Piaget contends that visual images

correspond basically to the drawing which can be made of objects or events no longer perceived.

Two studies centered on imagery were conducted by Youniss and Robertson (1969; 1970). In the first experiment, it was observed that deaf and hearing children twelve years old functioned better in regard to imagery than deaf and hearing children eight and nine years old. This improvement corresponds to the span of the stage of concrete operations. Results of the second experiment confirmed findings in the first, and supported Piaget's position on mental imagery, that mental imagery and general symbolic functioning are dependent on the growth of intelligence and not vice-versa. It is also indicated that "certain forms of adolescent thinking do not require internalized linguistic symbols" (Youniss & Robertson, 1970).

Several studies on memory of the deaf are varied in nature and conclusions. Wallace & Corballis (1973) examined short-term memory and coding strategies in the deaf. Using tasks of four and five letter sequences, these researchers analyzed results of written recall responses. They concluded that the deaf are inferior to the hearing, and that they encoded verbal material differently. Another project on written recall of five consonant sequences was done by Conrad and Rush (1965). They also determined a different kind of non-acoustic encoding used by the deaf, but could not identify what it was. An experiment by Hoemann et al (1974) was described as showing that deaf children encode categorically,

and that normal abstract thinking and information processing occur.

Immediate memory span for digits, rather than letters, was studied by Blair (1957). Results of this study indicated that in this kind of memory the deaf were inferior to the hearing. However while hearing subjects had longer forward spans, deaf subjects showed no difference in forward or backward spans.

Categorization and Verbalization Studies

A look at cognitive processes is offered in a somewhat different perspective by the studies of Kates et al (1962) and Silverman (1967). Giving more emphasis to the role of language, these researchers present works that are in line with Vygotsky's tenets. Vygotsky's three major modes of categorization - superordinate, functional, and associative, were measured in Silverman's study. When deaf and hearing children, in his study, were matched exactly on reading achievement scores, all differences in categorization behavior disappeared. Patterns observed in categorization modes of the deaf suggested that deficiencies in categorization behavior may contribute to deficient langugage performance in the deaf child (Silverman, 1967).

Experiments that were conducted by Kates et al (1962) indicated few differences between deaf and hearing subjects with regard to categorization and verbalization. The research technique which separated categorization and verbalization, made possible the major finding that deaf children show dissociation between these two processes. The extent of this dissociation in deaf subjects showed them to be similar to

younger hearing subjects. In short, the few differences found in these two studies between deaf and hearing fall along normal developmental lines.

Suppes' Survey of Cognition in Handicapped Children

A comprehensive work surveying cognition in handicapped children is offered by Suppes (1972). He looked at development of cognitive skills in language, concept formation and arithmetic in blind, retarded, and deaf subjects.

In his discussion of language research by various professionals with deaf, Suppes stresses work done on written language. One conclusion drawn from Brannon and Murry's work is that although the deaf appear inferior in structural accuracy, they do not seem to be inferior in productivity (Suppes, 1974, p.152). Another well supported thesis of theirs is that deaf children's sentences begin and end with relatively few mistakes compared with the number of mistakes that occur in the middle parts. Further conclusions are drawn that the written language of deaf children, as evaluated by Cooper and Rosenstein, has shorter and simpler sentences with different distributions of the parts of speech than those made by normal hearing children (Suppes, 1974, p.153). And finally, Marshall and Quigley see growth in complexity of the written language of deaf children due mainly to the use of complex noun phrases as opposed to more complex verb phrases (Suppes, 1974, p. 154).

Concept formation literature reviewed by Suppes features issues raised by Furth pertaining to the role of langugage in concept formation. Furth is reported to believe that once the verbal aspects of a task are

removed, deaf children do not show significant deficits in concept formation. He further states that the process oriented approaches to cognitive skills seem to contend that some sort of language is being used internally, even if it isn't the language of the society in which the children live. Suppes goes on to cite Vernon's studies (reported in the early part of this paper) for support of his thesis (Suppes, 1974, p. 163).

Abstraction ability of deaf children is discussed only briefly in Suppes' article. Many studies have been found linking abstraction and verbal functioning, he reports. He tells also of researchers who did not find a significant difference between hearing and deaf children when non-verbal abstract functioning was measured (Suppes, 1974, p. 163).

Studies on arithmetic and mathematical skills of deaf children, Suppes informs us, are minimal. Commenting on data collected at the Institute at Stanford, he says that conclusions from a massive data analysis there, involving 800 deaf and 1500 hearing students across the United States, emerge as follows (Suppes, 1974, p. 168):

> ...The performance of the deaf children is almost always slightly better than that of the normal hearing children... These massive data support the thesis that the cognitive performance of deaf children is as good as that of normal hearing children, when the cognitive task does not directly involve in a central way verbal skills.

In his concluding remarks, Suppes calls for more attention to determining the effects of various training procedures.

Applications of Cognitive Theory to Training

Any theory of cognitive development must be weighed with respect to its implications for and applications to training. The necessity of incorporating cognitive training into curriculum has been anticipated for some time. As early as 1950 one of the most influential figures in the deaf field, Powrie V. Doctor, in commenting on the difficulties of teaching the abstract to the deaf, ventured the suggestion that teacher training include courses on "Cognition" to facilitate communication by teachers of abstract concepts to the students (Doctor, 1950).

An experiential deficiency is viewed by some theorists including Liben (1975, Note 3) and Goetzinger (1967) as an explanation of measured cognitive deficits or lower cognitive performance. This is seen as an extension of Piaget's beliefs that actions and not language are the foundations of logical thought. Liben questions the language deprivation hypothesis with regard to the traditional assumption that the deaf are in fact a group "without language." She points out that some young deaf children and most deaf adolescents and adults have at least some competence in Ameslan. Furth (1966) extends this line of thought, asserting that the deaf child faces "experiential deficiencies" described as: "a blending of social, emotional, and intellective neglect" (Furth, 1966).

Liben's recommendation centers on communication modes for training (Liben, 1975):

> Perhaps it is time to relinquish our belief that only oral languages can fulfill communicative and cognitive needs, and to

> encourage the use of combined manual and spoken language systems with deaf children. By doing so, we should be able to reduce a large component of the experiential deficiencies now faced by deaf children (p.12).

It is of interest to note, however, that Liben has also drawn attention to the "research vacuum" of work on the role of early audition on exploration and on cognitive development (Liben, 1975). With Piaget's emphasis on the contribution to cognitive development of a self-feedback mechanism for the child in early stages (Tomlinson-Keasey, 1974) this author sees the exploration of early audition as an obvious and crucial need for a better understanding of process development and training directions for hearing impaired.

Curriculum and Cognition

There appears to be a revived and/or increasing interest in establishing Piagetian based curriculum in some deaf education programs. Featured in a curriculum guide for pre-primary hearing impaired children three to six years of age (1971) described by Minnesota State Department of Education, is: "a cognitive approach according to Jean Piaget, modified for pre-primary hearing impaired children." Wolff (1975) tells of extensive in-service teachertraining in the east, for teachers of the deaf, in workshops on "Piaget activities for thinking teachers and thinking children." Furth (1971) described activities in a "thinking laboratory adapted for deaf children." These activities are reported to be "based on Piaget's principle of action rooted intelligence to determine if thinking might be successfully encouraged in the classroom through activities which were not highly dependent on verbal performance." Finally, Moores (1972, Note 4) reports

that subjects in a program basing its curriculum on concepts of J. Piaget scored higher than other subjects on a test of cognitive development measures.

It is by no means a consensus in the special education field that cognitive training is feasible and/or appropriate. In a lengthy discourse on the subject of cognitive training at a National Regional Resource Center Conference, Mann (1974; Note 5) cautions:

> Let us not fool ourselves that we have trained some processes... when in fact we have simply been training an individual to do things in one situation that has similarities to another that will improve his performance in the other (p. 106).

He goes on to advise that if training cognitive processes improves academics, then training in academics will improve cognitive processes. Speaking more specifically, Mann claims that translating cognitive processes into instructional processes have not been overly successful. Acknowledging one successful translation, that of Skinner, he comments as follows:

> The most successful has come from Skinner, and as we know, his is a non-theoretical stance dealing with observables and eschewing hypothetical cognitive constructs. While task analysis, instructional objectives, mastery learning, and criterion referenced measurement, which I recommend to you as desirable "non process" approaches, have "cognitive" inheritances and components, all can make their contributions without relying upon cognitive inferences.

Mann's concluding remarks contain the thought that the concentration upon cognitive processes is special education's "current digression."

Discussions and Comments

It is the position of this writer that cognitive training should not be dismissed as a mere digression but that it merits continued attention. Mann's statements seem somewhat of an oversimplification or overgeneralization, a trap into which some ardent proponents of a theory are sometimes prone to fall. Cautions such as the one he offers, however, can serve to temper enthusiasm for making cognitive training a major priority in educational programming. As one who aligns with the behavioral approach to education, this writer sees a need for much more empirical evidence to give specific direction to cognitive training with handicapped learners.

Certainly the special education field and the field of deaf education in particular have come a long way since the early part of the century when mental ability was focused upon primarily in terms of quantitative evaluation relative to average performance norms. A sophisticated approach to the language and thought issue has already been established. However, controversies still rage and empirical evidence cited in this paper is not enough to ease the doubts of highly influential professionals in the field.

In considering the various cognitive approaches, this writer has strong reservations about any theory which negates the value of early intervention. A philosophy such as the child development tradition which says the most important thing in a child's development is that which comes from within

seems incongruous with the present societal guarantees to learning opportunities. More appropriate is the perspective that intelligence is a set of acquired information-processing skills, and that any intellectual content can be taught early if the teaching is adapted to the child's cognitive level.

Along with Mann, this writer "recommends as desirable" task analysis, instructional objectives, mastery learning, and criterion referenced measurement. Also advocated is a view of cognitive development within a cultural training perspective, using a Piagetian theory in terms of cognitive map, but maintaining a Skinnerian approach.

Concluding thoughts focus on two statements. The first one is a reminder by Wadsworth (1971, 1.135) that Piaget's work over the last fifty years has generated a degree of interest that is unprecedented. The second is a thought dryly expressed by Mann (1974) that:

> Cognition, like taxes, has always been with us; just as Moliere's Bourgeois Gentilhomme discovered in respect to prose, it is something that we have been doing all our lives! (p. 107).

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